

CLAIMS:

Claims 4-6 (Canceled).

Claims 7-10 (New).

RECEIVED
CENTRAL FAX CENTER

APR 18 2007

7. (New) A golf putting training device comprising:

a housing constructed of material capable of passing microwave signals from the interior of said housing to an exterior object;

a target strike plate mounted to the front side of said housing which serves as a putting target and receives an impact of a rolling golf ball struck by a golfer with a putter from two feet away, wherein a layer of impact absorbing material is sandwiched between said housing and said target strike plate;

positional stabilization means comprising a weight placed inside said housing and a plurality of bumpers attached to the bottom of said housing;

a doppler microwave speed measurement sensor positioned within said housing behind said strike plate such that emitted microwave energy projects outward through said strike plate on a direct path toward said rolling golf ball, said doppler microwave speed measurement sensor being responsive to movement of said rolling golf ball by providing a doppler audio output signal whose frequency is proportional to the speed of said rolling golf ball;

amplification circuitry to amplify said doppler audio output signal into an amplified doppler audio output signal and conversion circuitry that converts said amplified doppler audio output signal to a doppler microwave speed measurement digital signal;

green speed setting means responsive to selection of a plurality of green speed values and display of said green speed values to said golfer;

an impact detection sensor responsive to said impact of said rolling golf ball with said target strike plate;

amplification circuitry that amplifies said impact detection sensor signal into an amplified impact detection sensor signal and conversion circuitry that converts said amplified impact detection sensor signal to an impact sensor digital signal ;

a circular memory buffer comprised of a plurality of random access memory elements into which period measurements of every cycle of said doppler microwave speed sensor digital signal are stored;

a write index which serves as a clockwise storage guide pointing to locations in said circular memory buffer where said period measurements are stored, said write index also serving as a read index in counter-clockwise retrieval of said period measurements from said circular memory buffer upon said impact of said rolling golf ball with said target strike plate;

signal processing means to measure the period of every said doppler microwave speed measurement digital signal and to store said period into said circular memory buffer; said signal processing means further reads said green speed setting means and converts said green speed setting means green speed value into an equivalent coefficient of friction of the surface to be simulated; said signal processing means responds to an interrupt from said impact sensor digital signal upon said impact of said rolling golf ball with said target strike plate; said signal processing means further includes means to access said period measurements from said circular memory buffer using said write index as a counter-clockwise read index, and, means to sort said circular memory buffer of said period measurements from shortest to longest, taking the reciprocal of the average of the second and third shortest said period measurements multiplied by a doppler microwave scaling factor resulting in said estimated speed; said signal processing means further squares said estimated speed into a squared estimated speed, and dividing said squared estimated speed by the product of said coefficient of friction multiplied by two times the earth's gravitational constant of acceleration to determine an estimated putting distance of said rolling golf ball; said signal processing means further comprising means to output an indication of said rolling golf ball rolling progress wherein said signal processing means communicates said estimated putting distance to said golfer.

8. (New) A golf putting training device comprising:

a housing constructed of material capable of passing microwave signals from the interior of said housing to an exterior object;

a target strike plate mounted to the front side of said housing which serves as a putting target and receives an impact of a rolling golf ball struck by a golfer

with a putter from two feet away, wherein a layer of impact absorbing material is sandwiched between said housing and said target strike plate;

positional stabilization means comprising a weight placed inside said housing and a plurality of bumpers attached to the bottom of said housing;

a doppler microwave speed measurement sensor positioned within said housing behind said strike plate such that emitted microwave energy projects outward through said strike plate on a direct path toward said rolling golf ball, said doppler microwave speed measurement sensor being responsive to movement of said rolling golf ball by providing a doppler audio output signal whose frequency is proportional to the speed of said rolling golf ball;

amplification circuitry to amplify said doppler audio output signal into an amplified doppler audio output signal and conversion circuitry that converts said amplified doppler audio output signal to a doppler microwave speed measurement digital signal;

an impact detection sensor responsive to said impact of said rolling golf ball with said target strike plate;

amplification circuitry that amplifies said impact detection sensor signal into an amplified impact detection sensor signal and conversion circuitry that converts said amplified impact detection sensor signal to an impact sensor digital signal ;

a circular memory buffer comprised of a plurality of random access memory elements into which period measurements of every cycle of said doppler microwave speed sensor digital signal are stored;

a write index which serves as a clockwise storage guide pointing to locations in said circular memory buffer where said period measurements are stored, said write index also serving as a read index in counter-clockwise retrieval of said period measurements from said circular memory buffer upon said impact of said rolling golf ball with said target strike plate;

signal processing means to measure the period of every said doppler microwave speed measurement digital signal and to store said period into said circular memory buffer; said signal processing means responds to an interrupt

from said impact sensor digital signal upon said impact of said rolling golf ball with said target strike plate by halting said period measurements and starting a speed estimation process; said signal processing means further includes means to access said period measurements from said circular memory buffer using said write index as a counter-clockwise read index, and, means to sort said circular memory buffer of said period measurements from shortest to longest, taking the reciprocal of the average of the second and third shortest said period measurements multiplied by a doppler microwave scaling factor resulting in said estimated speed; said signal processing means further comprising a peripheral interface port through which said signal processing means transmits said estimated speed;

a green speed setting selector within a personal computer graphical user interface software program allowing selection of a stimp value in which to simulate, said green speed setting selector having a plurality of possible stimp settings for simulating a variety of green speeds, said green speed setting selector being converted into an equivalent coefficient of friction by said personal computer graphical user interface software program;

said personal computer graphical interface software program comprising means to receive said estimated speed of said rolling golf ball from said peripheral interface port of said signal processing means; said personal computer graphical user interface software program further squares said estimated speed into a squared estimated speed, and dividing said squared estimated speed by the product of said coefficient of friction multiplied by two times the earth's gravitational constant of acceleration in feet per second per second to determine an estimated putting distance of said rolling golf ball;

whereby said personal computer graphical user interface software program further comprising means to convey an indication of said rolling golf ball rolling progress wherein said personal computer graphical interface software program communicates said estimated putting distance and outputs a rolling progress to said golfer.

9. (New) The golf putting training device of claim 8 in which the peripheral interface port is a universal serial bus.

10. (New) A method of estimating the projected roll distance of a golf ball past an impact point with a target strike plate placed two feet from the golf ball's starting position, the golf ball having been struck by a golfer with a putter, and, conveying the estimated distance and an indication of the golf ball's rolling progress to the golfer comprising the steps of:

providing a housing that includes a ball impact strike plate, a doppler microwave speed measurement sensor, doppler microwave speed measurement amplifier and schmitt trigger, impact sensor and associated amplifier and schmitt trigger, microcontroller, green speed setting switch, circular memory buffer; an internal weight, bumpers mounted on the bottom side of the housing, and a display for outputting the estimated roll distance;

positioning the housing two feet from the starting position of the golf ball such that the impact strike plate is orthogonal to the intended path of the golf ball so that a golfer can putt a golf ball and cause a collision of the rolling golf ball with the impact strike plate;

positioning the doppler microwave speed measurement sensor behind the impact strike plate within the housing such that the rolling golf ball is illuminated by the doppler microwave speed measurement sensor which provides an audio output signal indicative of the golf ball's speed;

amplifying the doppler microwave speed sensor audio output signal and converting the amplified doppler microwave speed sensor audio output signal to a digital signal by connecting it to a schmitt trigger; the output of the schmitt trigger connecting to a first interrupt pin of a microcontroller that responds to each negative edge of the microwave speed sensor digital signal, the time between each negative edge being the period;

positioning an impact sensor within the housing to respond with a signal when the impact strike plate is struck by the rolling golf ball;

amplifying the impact sensor signal and converting the amplified impact sensor signal to a digital signal by connecting it to a second schmitt trigger; the output of the second schmitt trigger connecting to a second interrupt pin of the microcontroller;

processing the doppler microwave speed sensor digital signal by storing the elapsed time between interrupt negative edges into a circular memory buffer for any movement of any object within the doppler microwave speed sensor's field of view;

processing the impact detection interrupt by halting any further interrupts of the doppler microwave speed sensor digital signal, and starting at the most recent elapsed time stored and working backwards, select the newest elapsed time measurements from the circular memory buffer that represent the speed of the rolling ball just prior to impact with the impact strike plate;

converting the green speed setting switch value into an equivalent coefficient of friction value used in the determination of the golf ball rolling distance estimation step;

determining the estimated rolling golf ball speed by sorting the elapsed time measurements in descending order from shortest to longest and taking the reciprocal of the average of the second and third shortest elapsed time values; the reciprocal, then being multiplied by a doppler microwave speed sensor constant to obtain an estimated rolling golf ball speed in feet per second;

determining an estimated golf ball rolling distance that the golf ball would have rolled past the impact strike plate by squaring the estimated rolling golf ball speed into a squared estimated speed, and dividing the squared estimated speed by the product of the coefficient of friction multiplied by two times the earth's gravitational constant of acceleration in feet per second per second; and,

outputting a rolling progress indication and the estimated golf ball roll distance to a golfer.